CIRCUIT DESCRIPTION
AMERICAN TELEPHONE & TELEGRAPH CO.,
BELL TELEPHONE LABORATORIES, INC.
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POWER SYSTEMS
800 TYPE PLANTS
RINGING CIRCUIT
4-PARTY SEMI-SELECTIVE
AC-DC MACHINE RINGING
ONE MOTOR COMMERCIAL RINGING
AND COIN CONTROL SETS
WITH TONE ALTERNATORS AND
MERCURY INTERRUPTERS
PANEL OFFICES
803-B PLANT

CHANGES

B. CHANGES IN APPARATUS

B.1 2, 5, 8 and 65 amp. fuses (except 2 amp. fuses for CC) have been rated "Mfr. Disc" and replaced by 1, 3, 6, 10 or 70 amp. fuses.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Notes 15 and 16 have been added.

D.2 All 2, 5, 8 and 65 amp. fuses (except 2 amp. fuses for CC) are rated "Mfr. Disc." and replaced by 1, 3, 6, 10 or 70 amp. fuses as shown on the circuit.

D.3 In table 1 the 70 amp. "SF" fuse was formerly 65 amp.

D.4 Internal connections of field and battery charging rheostats have been changed to agree with latest issue of KS-5031.

D.5 Designations (R1) and (R2) and terminal numbers 1, 2 and 3 have been shown on ringing machine field rheostats.

D.6 Splices have been shown in three of the voltage regulator leads.

D.7 Reference to Note 16 has been added to Table 3.

DEVELOPMENT

1. PURPOSE OF CIRCUIT

1.1 To furnish ringing current at the voltages required at the central office.

1.2 To provide interrupted ringing current, tripping and pick-up at the proper intervals for machine ringing.

1.3 To furnish such tones as are required in central offices of the above type.

1.4 To provide a circuit for automatically starting the battery driven one motor ringing and coin control set and transferring the load to this set from a line driven set during ringing voltage failure.

2. WORKING LIMITS

2.1 Central office battery limits, 20-28 and 45-50 volts.

2.2 Ringing machine voltage limits, 105+5, -4 volts, and 100+3, -2 volts.

2.3 Ringing battery limits 16-19 volts.

OPERATION

3. FUNCTIONS

3.1 To generate 20 cycle alternating current at the voltages given above.

3.2 To interrupt the alternating current ringing and the pick-up at the proper intervals.

3.3 To generate high and low tone and audible ringing tone by means of a tone alternator.

3.4 To automatically transfer ringing, tone and signal leads to the battery driven ringing machine during an interruption in the supply from the line driven sets.

3.5 To automatically transfer the lead to the line driven sets upon restoration of the voltage at the sets.

3.6 To provide means of starting the battery sets by manually operated switches without transferring the load from the line set.

3.7 To start the battery drives set by means of a manually operated switch and to transfer the load automatically.

3.8 To automatically maintain the superimposing batteries within the standard limits.

4. CONNECTING CIRCUITS

4.1 Charge circuits.

4.2 Discharge circuits.

4.3 Alarm circuits.

4.4 Howler circuit.

4.5 Service circuit.

DETAILED DESCRIPTION

5. RINGING

5.1 Ringing voltage is produced by an alternating current ringing generator. The ringing generator is of the double current type and produces alternating current at the collector rings and direct current across the commutator brushes. The alternating current ringing voltage is applied across the primary of an insulating transformer which is grounded at its mid-point. The secondary of the transformer is provided with taps for alternating current voltages of 77, 85, 100 and 105. These are the normal voltage ranges required for various classes of service and types of central office equipment. The leads from the direct current commutator brushes together with a ground lead comprise the 220 volt, 3-wire coin control system which supplies 110 volts positive for coin collect and 110 volts negative for coin refund. Two ringing sets are provided for each exchange, one driven by a line motor from the commercial power service and the other driven by a battery motor from the exchange central office battery. The continuous alternating current ringing produced by the ringing machine and transformer is interrupted at suitable intervals to produce machine ringing. The interruption of the ringing current is effected by mercury interrupters. The mercury interrupter proper consists of two steel rings with annular channels on the inner faces, clamped tightly together with an insulating partition between. The insulator between the two halves of the switch has one or several openings which register with the channels. When partially filled with mercury and rotated on a horizontal axis, contact is made from one ring to the other by means of the mercury only when an opening in the insulator dips into the mercury. As the weight of the mercury is large and its frictional affect small, it remains at the bottom of the switch when the switch is rotated. A combination of three rings and two insulating partitions is used for machine ringing and other conditions which require that one voltage or tone be

placed on a central channel for a portion of a revolution and another voltage or tone with different characteristics placed on the central channel during the remainder of the revolution. The leads are carried from the ringing machine transformers and interrupters to automatic transfer switches. These switches are mounted vertically on a panel with the shaft controlling twelve individual switches in a horizontal position. When the line driven set is in operation, the switch is held in the switch position to which the leads for the line set are connected by spring tension and gravity. In case the load is transferred to the battery set, the switch is held in this position by coils energized from 48 volt battery.

6. SIGNALS AND TONES

6.1 The primary source of tones is a tone alternator consisting of three inductors, the rotors of which are fitted on an extension of the ringing generator shaft. The stators are inclosed in a housing which bolts to the ringing generator pedestal. One inductor of the tone alternator produces low tone, a second high tone and a third an audible ringing tone which when superimposed upon the ringing voltage by means of suitable transformers and retardation coils, gives a tone which is audible at the calling instrument during ringing. The mercury interrupters are rotated on shafts which protrude from each side of the interrupter gear case. The gears in the gear case are driven from the ringing generator shaft extension which mounts the rotor for the tone alternator. The machine ringing mercury interrupters are rotated at 10 revolutions per minute.

The high and low tones from the tone alternator are used in connection with repeating coils to produce tones for exchange use. The tone alternators, mercury interrupters and coils are wired to the automatical transfer switches in the same manner as described for ringing.

7. AUTOMATIC TRANSFER

7.1 Assume an interruption in ringing voltages from Ringing Generator 1. The (LV) relay, which is connected to the 105V ± lead from the Ring. Gen. 1 transformer through the (L1), (L2) and (L3) condensers and to ground through the normally closed (RING TRNS) switch, will release placing battery on the windings of the (R) and (ST) relays. Their windings being grounded these relays operate, the (R) relay connecting the winding of the (U) relay to the negative armature terminal of Ringing Generator 2 and the (ST) relay causing

the automatic starter to operate. (The RING M2 START switch in parallel with the contact of the (ST) relay is normally open). The operation of the automatic starter starts the motor from battery, limiting the current during starting and excites the shunt field. When the motor comes up to speed, the (U) relay operates. It is connected across the armature through the contacts of the (R) relay referred to above, and the DPST motor switch. The (T1), (T2) and (T3) relays are then operated through the contacts of the (U) relay transferring the load to the battery driven ringing set.

When power is restored the (LV) relay operates causing the (ST) and (R) relays to release. The release of the (R) relay in turn causes the (U) and (T1), (T2) and (T3) relays to release restoring the load to the line driven sets. The release of the (ST) relay causes the starter to release stopping the battery driven set.

When the (ST) relay or RING M2 START switch is operated as covered above, battery is placed on the alarm lead which brings in an alarm. The operation of the 92-A key will cut off the alarm bell when desired.

8. AUTOMATIC TRICKLE CHARGE CIRCUIT FOR RINGING BATTERY

8.1 Arrangement

This circuit is designed to maintain the ringing battery automatically within the standard voltage limits. Briefly, it is designed to operate as follows: The charging circuit will normally be adjusted to provide a charging current sufficient to maintain the batteries, and float the voltage relay and alarm relay drains. When ringing drains discharge the battery sufficiently to reach the lower limit of the voltage relay, series resistance in the charging leads will be short circuited thus increasing the charging current to full output of the rectifier. When the battery voltage reaches the upper limit of the voltage relay, the circuit is restored to normal. A copper oxide rectifier is used as the charger.

8.2 To Put Automatic Circuit in Service

The output of the rectifier should be adjusted by means of the jacks which are accessible after the top is removed. A setting of 0.25 amperes approximately will be suitable. This setting should be made with the rheostat short circuited, by blocking the CHG relay operated. The CHG relay should then be released and the rheostat adjusted until the charging current balances the voltage and alarm relay drains and maintains battery losses. This setting will be from 55 to 65 milliamperes.

8.3 Automatic Operation

Under a low voltage condition on the battery, the low contacts of the voltage relay will make contact operating the ON relay. The ON relay in turn operates the LK relay which (1) closes a path from the high voltage contact of the voltage relay to the OF relay and (2) operates the CH relay. The LK relay through its contacts, also provides a holding ground for the (ON) relay. The (CH) relay short circuits the rheostat in the charging lead thus increasing the charging current to the maximum setting. The continuity contacts on the (CH) relay are only for simplifying adjustments on the (ON) and (OF) relays. When the voltage of the battery rises to the high value, due to the increased charging current, the high voltage contacts of the voltage relay operate placing ground on the winding of the (OF) relay through the contacts of the (LK) relay. The (OF) relay then operates placing ground on both ends of the (ON) relay windings. This releases the (ON) relay which in turn releases the (LK) and (OF) relays, restoring the circuit to normal, since the (CH) relay will also release removing the short circuit from the charging resistance.

8.4 Alarm

The (AB) relay in the superimposing battery charging leads acts as an alarm on the outputs of the rectifiers. If the power or charging fuses fail, the relays will release placing a ground on the ringing battery charge alarm lead. The KS-5250 rectifier used to float the ringing battery has an internally connected retardation coil to cut down the rectifier noise.

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